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PRODUCTION OF ASSIMILABLE ORGANIC CARBON THROUGH THE USE OF FENTON'S REAGENT

Mr. Suksan Iemsophon

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By Mr. Suksan Iemsophon
Field of Study Environmental Management
Thesis Advisor Assistant Professor Eakalak Khan, Ph.D.
Thesis Co-advisor Associate Professor Wanpen Wirojanagud, Ph.D.

Accepted by the Graduate School, Chulalongkorn University in
Partial Fulfillment of the Requirements for the Master 's Degree


..... Dean of Graduate School
(Professor Suchada Kiranandana, Ph.D.)

THESIS COMMITTEE


..... Chairman
(Assistant Professor Sutha Khaodhiar, Ph.D.)


..... Thesis Advisor
(Assistant Professor Eakalak Khan, Ph.D.)


..... Thesis Co-advisor
(Associate Professor Wanpen Wirojanagud, Ph.D.)


..... Member
(Assistant Professor Pinthita Moongkarndee, Ph.D.)

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การศึกษานี้มุ่งศึกษาผลกระทบของปัจจัยแปรผัน (พีเอช, ความเข้มข้นของไฮโดรเจนเปอร์ออกไซด์, ความเข้มข้นของไอออนเหล็ก2, และ ระยะเวลาในการทำปฏิกิริยา) และหาสภาพที่เหมาะสมในการใช้เฟินตันรีเอเจนท์เพื่อเพิ่มค่าเอไอซี ในน้ำที่ปนเปื้อนสารอินทรีย์ในระดับต่ำ น้ำตัวอย่างที่ใช้ในการทำการทดลองได้แก่ น้ำดิบผิวดิน และน้ำดิบสังเคราะห์ผสม 2,4 ไดคลอโรฟีนอล การทดลองกระทำที่ 3 อัตราความเข้มข้นของ ไฮโดรเจนเปอร์ออกไซด์ และ 3 อัตราความเข้มข้นของ ไอออนเหล็ก2 ที่ พีเอช 2 3 และ 4

ผลการทดลองในน้ำตัวอย่างทั้งสองประเภทชี้ให้เห็นว่า การเพิ่มความเข้มข้นของไฮโดรเจนเปอร์ออกไซด์มีผลโดยตรงต่อการเพิ่มค่าเอไอซี ค่าพีเอช เป็นปัจจัยเสริม การเพิ่มความเข้มข้นของไอออนเหล็ก2 ไม่มีผลต่อระดับการเพิ่มขึ้น แต่ช่วยให้อัตราการเพิ่มเร็วขึ้น การเพิ่มขึ้นของเอไอซีเกิดขึ้นภายในระยะเวลา 10 นาที และ มีความสัมพันธ์กับปฏิกิริยาลำดับที่1 มากกว่า ปฏิกิริยาลำดับที่2 ค่าการเพิ่มขึ้นของเอไอซีในน้ำดิบผิวดิน พบมีค่ามากที่สุดที่อัตราส่วนความเข้มข้น 10:1 (ไฮโดรเจนเปอร์ออกไซด์:ดีไอซี), 0.05:1 (ไอออนเหล็ก2:ไฮโดรเจนเปอร์ออกไซด์), และพีเอช 3 สำหรับน้ำดิบสังเคราะห์ค่ามากที่สุด พบที่ อัตราส่วนความเข้มข้น 10:1 (ไฮโดรเจนเปอร์ออกไซด์:ดีไอซี), 0.5:1 (ไอออนเหล็ก2:ไฮโดรเจนเปอร์ออกไซด์), และ พีเอช 3.

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ลายมือชื่อนิสิต.....*I. Salm*.....
ลายมือชื่ออาจารย์ที่ปรึกษา.....*Ekklun*.....
ลายมือชื่ออาจารย์ที่ปรึกษาร่วม.....*W. Wirojanagud*.....

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ENHANCEMENT

SUKSAN IEMSOPHON: PRODUCTION OF ASSIMILABLE ORGANIC
CARBON THROUGH THE USE OF FENTON'S REAGENT.

THESIS ADVISOR: ASST. PROF. EAKALAK KHAN, Ph.D.

THESIS COADVISOR : ASSOC. PROF. WANPEN WIROJANAGUD, Ph.D.

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Batch experiments were conducted to determine the effects of Fenton's reagent ($\text{H}_2\text{O}_2/\text{Fe}^{2+}$) on the production of assimilable organic carbon (AOC) in water. The objectives were to study the effects of pH, H_2O_2 and Fe^{2+} doses, and reaction time (kinetic) on AOC increase and to identify optimal conditions for the highest AOC production. Surface water and 2,4 dichlorophenol (2,4-DCP) solution were the two types of water samples examined. Three different doses of H_2O_2 ($\text{H}_2\text{O}_2:\text{DOC}$ of 0.5:1, 2:1, and 10:1) and Fe^{2+} ($\text{Fe}^{2+}:\text{H}_2\text{O}_2$ of 0.05:1, 0.1:1, and 0.5:1) and three pH (2, 3, 4) were used.

The results showed that the effects of H_2O_2 and Fe^{2+} doses, pH, and reaction time (kinetic) were similar in both types of water samples. AOC production increased with the increase of H_2O_2 concentration. Among the three pHs, pH 3 provided the highest increase whereas pH 2 offered the least. Higher Fe^{2+} concentration resulted in a faster rate of AOC production but did not contribute to the increase. The AOC production instantaneously took place in the first few minutes and was almost complete within 10-minute reaction time. The first order model was better than the second order model in describing the kinetics of AOC production. The optimal $\text{H}_2\text{O}_2:\text{DOC}$, $\text{Fe}^{2+}:\text{H}_2\text{O}_2$, and pH for surface water samples were 10:1, 0.05:1, and pH 3. For synthetic water samples, the best condition was observed at 10:1, 0.5:1, and pH 3.

Inter-Department: Environmental Management

Field of Study: Environmental Management

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Student's Signature

Advisor's Signature

Co-Advisor's Signature

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ACRONYMS

2,4-DCP	2,4-dichlorophenol
2,4,6-TCP	2,4,6-trichlorophenol
4-CP	4-chlorophenol
AOC	Assimilable organic carbon
AOC _{NOX}	Assimilable organic carbon determined using <i>Spirillum strain</i> NOX
AOC _{P17}	Assimilable organic carbon determined using <i>Pseudomonas fluorescense strain</i> P17
AOPs	Advance oxidation processes
AOX	Adsorbable organic halide
APHA	American Public Health Association
ATP	Adenosine triphosphate
BDOC	Biodegradable dissolved organic carbon
BOD	Biochemical oxygen demand
BOD ₅	Biochemical oxygen demand at 5-day incubation time
BOM	Biodegradable organic matter
CFU	Colony forming unit
COD	Chemical oxygen demand
DBPs	Disinfection by-products
DCA	Dichloroacetic acid
DOC	Dissolved organic carbon
Fe ²⁺	Ferrous ion
Fe ³⁺	Ferric ion
Fe(C ₂ O ₄) ₃ ³⁻	ferrioxalate ion
GAC	Granular activated carbon
HAA5	5 Haloacetic acids
H ₂ O ₂	Hydrogen peroxide
HO ₂ •	Peroxyl radical
HTP	Heterotrophic plate count
NBOM	Non-biodegradable organic matter

ACRONYMS (CONT.)

NF	Nanofiltration
N_{\max}	Maximum density
NOM	Natural organic matter
NOX	<i>Spirillum</i> strain NOX
O ₃	ozone
OH·	Hydroxyl radical
P17	<i>Pseudomonas fluorescence</i> strain P17
PCBs	Polychlorinated biphenyls
PVC	Polyvinyl chloride
r^2	Coefficient of determination
TCE	Trichloroethene
THMs	Trihalomethanes
TOC	Total organic carbon
USEPA	United State Environmental Protection Agency
UV	Ultraviolet light